

**Roughness measurement standards****line of product KNT 4070/03 (ultrafine roughness measurement profile)**

according to Physikalisch Technische Bundesanstalt (PTB)-measurement standards.

For calibrating and checking of the complete contact stylus instrument from the stylus to the measurement value display, as well as for calibrating and checking of optically sampling surface profilometer.

Introduction

The roughness measurement standards of the product line KNT 4058/...corresponding to ISO 5436 make it possible to lead back to national standards in the measuring range of

Ra: 0,2 to 10 μm and Rz: 1,5 to 50 μm .

The newer roughness measurement standards of the product line KNT 4070/... dispose of an ultrafine irregular roughness profile with smaller measuring results. They are in the measuring range of

Ra: 25 to 80 nm and Rz: 150 to 450 nm.

These ultrafine roughness measurement standards are manufactured by using modern manufacturing technologies. The profiles are turned into hard nickel plates. This surface shows a high resistance to wear when being measured. The hardness corresponds approximately to the hardness of our standards made of hardened stainless steel.

For the roughness under consideration, according to DIN 4768 respectively ISO 4288 a total evaluation length of $l_n = 1.25 \text{ mm}$ and a filter of the cut off of $\lambda_c = 0.25 \text{ mm}$. The repetition of profile is therefore 1.25 mm. The total length of the profile is 4 mm, before and behind it are plane surfaces with a minimum roughness (Rz approx. 8 nm).

Due to the manufacturing of the profile with a diamond cutting point disposing of a 5 μm cutting radius, there results no dependence of the measuring results of the contact stylus instruments with different top radius in the range of 1 to 5 μm . This is the same for the new standardised bandwidth limitation in ISO 3274.

Calibration

The exact measuring results are determined by the Physikalisch-Technische Bundesanstalt (PTB). or DAkkS accredited calibration laboratory. A plant calibration*) by HALLE GmbH is also possible.

The calibration is made by using contact stylus instruments according to ISO 3274 respectively DIN 4772. As parameters there are determined Ra, Rz and Rmax according to ISO 4287-1 respectively DIN 4768 and the parameters of the Abbott curve Rpk, Rk, Rvk, Mr1 and Mr2 according to ISO 135651-1 and 2 respectively DIN 4776. There are used the phase correct Gauss-Filters according to ISO 16610-21 respectively DIN 4777. The cut off λ_c is chosen according to ISO 4288 respectively DIN 4768.

Measuring and evaluation conditions

Due to the formerly mentioned norms the following measuring and evaluation conditons for calibrating the ultra fine roughness measurement standards apply:

- stylus tip radius; $r_1 = 2 \mu\text{m}$
- filter type: Gauß
- filter cut off: $\lambda_c = 0,25 \text{ mm}$
- bandwidth limitation: $\lambda_c : \lambda_s = 100 : 1$
- short cut off: $\lambda_s = 2,5 \mu\text{m}$

The measuring results with and without consideration of the short cut off of $\lambda_s = 2.5 \mu\text{m}$ vary only unessentially.

Different to the general recommendations in the norms, the parameters of the Abbott curve are also determined by using the cut off $\lambda_c = 0.25 \text{ mm}$.

*) without Abbott curve values